In the Claims:

1. (Canceled)

2. (Currently Amended) ~~The method of claim 1~~ A method for calibrating PET detector PMT gains in a detector unit, the method comprising the steps of:

(a) conducting a calibration procedure;

(b) determining whether a number of photons absorbed by a corresponding crystal exceeds a count threshold;

(c) if the threshold is exceeded, repeating steps (a) and (b); and,

(d) if the threshold is not exceeded, ending the calibration procedure

wherein the detector unit includes at least one detector block, where a block includes a two dimensional crystal array including crystals arranged adjacent an imaging area and a PMT array including a two dimensional array of PMTs arranged adjacent the crystal array opposite the imaging area, a target energy level being associated with the known average energy of a photon, the method further comprising the steps of:

providing a calibration photon source adjacent the at least one block during a calibration period and, for each unit crystal:

(i) obtaining a calibration energy spectrum where the calibration spectrum indicates the number of detected photons at each of several possible energy levels; and

(ii) mathematically combining the calibration spectrum and a crystal specific gain factor to generate a shifted spectrum for the crystal;

combining the shifted spectrums for all unit crystals to generate a unit spectrum;

identifying a peak unit energy level for the unit spectrum where the peak unit energy level is the energy level at which the greatest number of photons was detected;

comparing the peak unit energy level and the target energy level; and

based on the difference between the peak unit energy level and the target energy level, adjusting the PMT gains for the unit PMTs.

3. (Original) The method of claim 2 further including the steps of, prior to the step of providing and during a commissioning procedure:

providing a commissioning photon source adjacent the at least one block and during a commissioning period, for each unit crystal:

(i) obtaining a commissioning energy spectrum where the commissioning spectrum indicates the number of detected photons at each of several possible energy levels;

(ii) identifying a peak energy level for the commissioning spectrum; and

(iii) mathematically combining the target energy level and the peak energy level to generate the crystal specific gain factor.

4. (Original) The method of claim 3 wherein the step of providing the calibration source includes the steps of providing a radionuclide within a patient and positioning the patient adjacent the crystal array.

5. (Original) The method of claim 3 wherein the step of mathematically combining to generate the gain factor includes the step of dividing the target energy level by the peak energy level.

6. (Original) The method of claim 5 wherein the step of mathematically combining to generate the shifted energy spectrum includes the step of multiplying each energy level within the spectrum by the crystal gain factor thereby shifting each of the energy level counts.

7. (Original) The method of claim 6 wherein the step of comparing includes the step of determining the percentage difference between the peak unit energy level and the target energy level and wherein the step of adjusting includes the step of adjusting the gain of each of the PMTs in a manner calculated to modify the gains by the percentage difference.

8. (Currently Amended) The method of claim 2 wherein the unit is a first unit and the ~~PMT~~ PET detector includes at least a second unit and wherein the process is performed simultaneously for each detector unit to adjust unit PMT gains.

9. (Original) The method of claim 8 wherein the first unit is positioned above the second unit in the detector.

10. (Original) The method of claim 2 wherein the calibration period is between one half second and ten seconds, and is repeated until the threshold is not exceeded.

11. (Currently Amended) ~~The method of claim 1~~ A method for calibrating PET detector PMT gains in a detector unit including at least one detector block, where a block includes a two dimensional crystal array including crystals arranged adjacent an imaging area and a PMT array including a two dimensional array of PMTs arranged adjacent the crystal array opposite the imaging area, a target energy level being associated with the known average energy of photon, the method comprising the steps of:

(a) conducting a calibration procedure;

(b) determining whether a number of photons absorbed by a corresponding crystal exceeds a count threshold;

(c) if the threshold is exceeded, repeating steps (a) and (b); and,

(d) if the threshold is not exceeded, ending the calibration procedure;

the method further comprising the steps of:

(A) providing a commissioning photon source adjacent the at least one block and, during a commissioning period, for each unit crystal:

(i) obtaining a commissioning energy spectrum where the commissioning spectrum indicates the number of detected photons at each of several possible energy levels;

(ii) identifying a peak energy level for the commissioning spectrum at which the greatest number of photons was detected; and

(iii) mathematically combining the target energy level and the peak energy level to generate a crystal specific gain factor;

(B) providing a radionuclide within a patient and positioning the patient adjacent the crystal array and, during a calibration period, for each unit crystal:

(i) obtaining a calibration energy spectrum where the calibration spectrum indicates the number of detected photons at each of several possible energy levels; and

(ii) mathematically combining the calibration spectrum and the crystal specific gain factor to generate a shifted spectrum for the crystal;

combining the shifted spectrums for all unit crystals to generate a unit spectrum;

identifying a peak unit energy level for the unit spectrum;

comparing the peak unit energy level and the target energy level; and

based on the difference between the peak unit energy level and the target energy level, adjusting the PMT gains for the unit PMTs.

12. (Original) The method of claim 11 wherein the step of mathematically combining to generate the gain factor includes the step of dividing the target energy level by the peak energy level.

13. (Original) The method of claim 12 wherein the step of mathematically combining to generate the shifted energy spectrum includes the step of multiplying each energy level within the spectrum by the crystal gain factor thereby shifting each of the energy level counts.

14. (Canceled)

15. (Currently Amended) ~~The apparatus of claim 14~~ An apparatus for calibrating PET detector PMT gains in a detector unit, the apparatus comprising:

means for conducting a calibration procedure;

means for determining whether a number of photons absorbed by a corresponding crystal exceeds a count threshold;

means for repeating the calibration procedure if the threshold is exceeded; and

means for ending the calibration procedure if the threshold is not exceeded;

the apparatus further including at least one detector block, where a block includes a two dimensional crystal array including crystals arranged adjacent an imaging area and a PMT array including a two dimensional array of PMTs arranged adjacent the crystal array opposite the imaging area, a target energy level being associated with the known average energy of a photon, the apparatus further comprising:

means for providing a calibration photon source adjacent the at least one block during a calibration period and, for each unit crystal:

(i) means for obtaining a calibration energy spectrum where the calibration spectrum indicates the number of detected photons at each of several possible energy levels; and

(ii) means for mathematically combining the calibration spectrum and a crystal specific gain factor to generate a shifted spectrum for the crystal;

means for combining the shifted spectrums for all unit crystals to generate a unit spectrum;

means for identifying a peak unit energy level for the unit spectrum where the peak unit energy level is the energy level at which the greatest number of photons was detected;

means for comparing the peak unit energy level and the target energy level; and

means for, based on the difference between the peak unit energy level and the target energy level, adjusting the PMT gains for the unit PMTs.

16. (Currently Amended) The apparatus of claim ~~14~~ 15 further including means for performing a commissioning procedure including:

means for providing a commissioning photon source adjacent the at least one block and during a commissioning period, for each unit crystal:

(i) means for obtaining a commissioning energy spectrum where the commissioning spectrum indicates the number of detected photons at each of several possible energy levels;

(ii) means for identifying a peak energy level for the commissioning spectrum; and

(iii) means for mathematically combining the target energy level and the peak energy level to generate the crystal specific gain factor.

17. (Original) The apparatus of claim 16 wherein the means for mathematically combining to generate the gain factor includes means for dividing the target energy level by the peak energy level.

18. (Original) The apparatus of claim 17 wherein the means for mathematically combining to generate the shifted energy spectrum includes means for multiplying each energy level within the spectrum by the crystal gain factor thereby shifting each of the energy level counts.

19. (Canceled)

20. (Currently Amended) ~~The apparatus of claim 19~~ An apparatus for calibrating PET detector PMT gains in a detector unit, wherein the detector unit includes at least one detector block, where a block includes a two dimensional crystal array including crystals arranged adjacent an imaging area and a PMT array including a two dimensional array of PMTs arranged adjacent the crystal array opposite the imaging area, a target energy level being associated with the known average energy of a photon, the apparatus comprising:

a processor for performing a pulse sequencing program to perform the steps of:

(a) conducting a calibration procedure;

(b) determining whether a number of photons absorbed by a corresponding crystal exceeds a count threshold;

(c) if the threshold is exceeded, repeating steps (a) and (b);

(d) if the threshold is not exceeded, ending the calibration procedure;

wherein the pulse sequencing program further causes the processor to perform the steps of:

providing a calibration photon source adjacent the at least one block during a calibration period and, for each unit crystal:

(i) obtaining a calibration energy spectrum where the calibration spectrum indicates the number of detected photons at each of several possible energy levels; and

(ii) mathematically combining the calibration spectrum and a crystal specific gain factor to generate a shifted spectrum for the crystal;

combining the shifted spectrums for all unit crystals to generate a unit spectrum;

identifying a peak unit energy level for the unit spectrum where the peak unit energy level is the energy level at which the greatest number of photons was detected;

comparing the peak unit energy level and the target energy level; and

based on the difference between the peak unit energy level and the target energy level, adjusting the PMT gains for the unit PMTs.

21. (Original) The apparatus of claim 20 wherein the pulse sequencing program further causes the processor to perform the steps of, prior to the step of providing and during a commissioning procedure:

providing a commissioning photon source adjacent the at least one block and during a commissioning period, for each unit crystal:

(i) obtaining a commissioning energy spectrum where the commissioning spectrum indicates the number of detected photons at each of several possible energy levels;

(ii) identifying a peak energy level for the commissioning spectrum; and

(iii) mathematically combining the target energy level and the peak energy level to generate the crystal specific gain factor.

22. (Original) The apparatus of claim 21 wherein, to perform the step of mathematically combining to generate the gain factor the program causes the processor to perform the step of dividing the target energy level by the peak energy level.

23. (Original) The apparatus of claim 22 wherein, to perform the step of mathematically combining to generate the shifted energy spectrum the program causes the processor to perform the step of multiplying each energy level within the spectrum by the crystal gain factor thereby shifting each of the energy level counts.

24. (Currently Amended) A method for improving image performance in PET imaging by stabilizing gain in compensators which are separately adjustable so that received digital signals are adjusted to compensate for PMT degradation, the method comprising:

(a) calculating PMT signal adjustments within a calibrator; and,

(b) adjusting output of compensators with the PMT signal adjustments;

wherein steps (a) and (b) are repeated during image acquisition in a PET scanner system until a number of photons absorbed by a corresponding crystal does not exceed a count threshold;

wherein the detector unit includes at least one detector block, where a block includes a two dimensional crystal array including crystals arranged adjacent an imaging area and a PMT array including a two dimensional array of PMTs arranged adjacent the crystal array opposite the imaging area, a target energy level being associated with the known average energy of a photon, the method further comprising the steps of:

providing a calibration photon source adjacent the at least one block during a calibration period and, for each unit crystal:

(i) obtaining a calibration energy spectrum where the calibration spectrum indicates the number of detected photons at each of several possible energy levels; and

(ii) mathematically combining the calibration spectrum and a crystal specific gain factor to generate a shifted spectrum for the crystal;

combining the shifted spectrums for all unit crystals to generate a unit spectrum;

identifying a peak unit energy level for the unit spectrum where the peak unit energy level is the energy level at which the greatest number of photons was detected;

comparing the peak unit energy level and the target energy level; and

based on the difference between the peak unit energy level and the target energy level, adjusting the PMT gains for the unit PMTs.

25. (Currently Amended) The method of claim 24 wherein steps (a) and (b) are performed simultaneously with image acquisition ~~aquistion~~.

26. (Currently Amended) An imaging system comprising:

a scanner system;

an apparatus for calibrating PET detector PMT gains in a detector unit, wherein the detector unit includes at least one detector block, where a block includes a two dimensional crystal array including crystals arranged adjacent an imaging area and a PMT array including a two dimensional array of PMTs arranged adjacent the crystal array opposite the imaging area, a target energy level being associated with the known average energy of a photon,

an image reconstruction processor for performing a pulse sequencing program, and,

~~ALC~~ acquisition, locator and coincidence circuitry, wherein the ~~ALC~~ circuitry includes a calibrator for calculating gain adjustment of compensators within the ~~ALC~~ circuitry and further wherein the image reconstruction processor includes program signals for defining an executable program for repeating calculation of gain adjustment in the calibrator during image acquisition performed by the scanner system;

wherein the pulse sequencing program further causes the processor to perform the steps of:

providing a calibration photon source adjacent the at least one block during a calibration period and, for each unit crystal:

(i) obtaining a calibration energy spectrum where the calibration spectrum indicates the number of detected photons at each of several possible energy levels; and

(ii) mathematically combining the calibration spectrum and a crystal specific gain factor to generate a shifted spectrum for the crystal;

combining the shifted spectrums for all unit crystals to generate a unit spectrum;

identifying a peak unit energy level for the unit spectrum where the peak unit energy level is the energy level at which the greatest number of photons was detected;

comparing the peak unit energy level and the target energy level; and

based on the difference between the peak unit energy level and the target energy level, adjusting the PMT gains for the unit PMTs.